

[T]he whole fishing industry is based on the exploitation of a wild population. This is almost a prehistoric concept on land, but it has never been questioned at sea.

Prince Philip, Duke of Edinburgh  
*Men, Machines, and Sacred Cows* (1984)

FOOD SAFETY

## Are Farmed Salmon Fit Fare?

In an analysis of salmon toxicants published 9 January 2004 in *Science*, a team led by environmental affairs professor Ronald Hites of Indiana University showed that farmed salmon contain significantly higher concentrations of 14 organochlorine contaminants such as polychlorinated biphenyls (PCBs) and dioxins than their counterparts caught in the wild. As a result, the investigators contend, farmed salmon may pose health risks to consumers, who should limit their intake of these fish and opt for the wild variety whenever possible.

The researchers measured contaminants in approximately 700 farmed and wild salmon from all over the world. Contaminant concentrations were significantly elevated in farmed Atlantic salmon compared to wild Pacific salmon (the two most commonly marketed types). Further, where the farmed salmon were raised made a big difference in their toxicant levels, with concentrations much higher in European fish than in North or South American salmon. The authors attribute these wide variations mainly to the fish oil/fish meal diet fed to farmed

salmon, which was found to be contaminated in ranges corresponding to those found in the salmon.

Hites and colleagues assessed the relative human health risks of consuming the amounts of PCBs, toxaphene, and dieldrin found in farmed salmon by using the U.S. Environmental Protection Agency (EPA) approach for devising fish consumption advisories. This method, which the authors aver is more comprehensive than Food and Drug Administration (FDA) standards, aims to help consumers avoid long-term, bioaccumulative exposure that could contribute to the risk of cancer and other health effects.

For farmed salmon purchased in Boston, San Francisco, Toronto, and several European cities, the authors recommend no more than one meal (eight ounces of uncooked meat) per month. For fish purchased in several other U.S. cities, they recommend no more than two meals per month. Wild salmon, on the other hand, was deemed safe to consume up to eight times per month.

This contrast in consumption recommendations lies at the heart of the vigorous debate that has ensued since the publication of the study. Eric Rimm, an associate professor of epidemiology and nutrition at the Harvard School of Public Health, is concerned that the study will alarm U.S. consumers unnecessarily: "To alarm people away

from fish because of some potential, at this point undocumented, risk of long-term cancer—that does worry me."

One FDA official reacted more bluntly. Terry Troxell, director of the FDA Office of Plant and Dairy Food and Beverages, told the 9 January 2004 *Washington Post* that "we've looked at the levels found . . . and they do not represent a health concern. In the end, our advice is not to alter consumption of farmed or wild salmon."

The *Science* authors stoutly defend their conclusions. "We are certainly not telling people not to eat fish," says coauthor David Carpenter, a professor of environmental health and toxicology at the University at Albany, New York. "We're telling them to eat less farmed salmon."

Carpenter adds that noncancer end points such as neurobehavioral, endocrine disruptive, and immunotoxic effects may be even more important than cancer, and that consumers should consider risks versus benefits. "The only well-documented benefit of fish consumption is omega-3 fatty acids, which help to reduce sudden cardiac death following a heart attack," he says. "Young people are not at risk of heart attacks, but they are at risk of accumulating carcinogens which will cause cancer years later." Further, he says, females may pass such contaminants along to their children. Future papers by the team will address these issues.

The *New York Times* weighed in on the controversy in a 17 January 2004 editorial that concluded, "The real message of the study is that the fish farming industry needs to clean up its feeding materials to reduce the level of contaminants. It would also be desirable for salmon to be labeled clearly to show whether it was farmed or wild, and where it came from."

Others agree with the *Times*. The Environmental Working Group and the Center for Environmental Health filed notice soon after the *Science* paper's publication that they intend to sue the farmed salmon industry and several major grocery chains under a California statute requiring companies to notify consumers if their products contain hazardous levels of chemicals known to cause cancer or reproductive harm. Michael Green, executive director for the Center for Environmental Health, told the Associated Press, "Our goal is to challenge [the industry] to change their practices so their fish is safe to eat." —Ernie Hood



**Fish tale.** European farmed salmon, like these from Scotland, have much higher concentrations of organochlorine contaminants than fish from other regions.

Chris de Bode/Panos Pictures

## REPRODUCTIVE HEALTH

## Malaria and HIV: Interplay of Risk

Does infection with malaria increase the risk that a mother with HIV will pass the AIDS virus along to her newborn? Recent findings are equivocal, but the possibilities they raise are alarming.

In the 21 November 2003 issue of *AIDS*, Heena Brahmabhatt, an assistant scientist at the Johns Hopkins Bloomberg School of Public Health, and colleagues described a reanalysis of data collected in the 1990s to examine whether controlling sexually transmitted diseases (STDs) in Ugandan women would lower the rate of HIV infection in these women's newborns. That question remains unanswered, but Brahmabhatt did find a positive relationship between the presence of malaria parasites in the placenta and the risk of HIV infection in the newborn. After adjusting for confounders, a baby born to a woman with placental malaria was almost three times as likely to be infected with HIV as a baby born to a mother without malaria parasites in the placenta.

Ronald Gray, a professor of reproductive epidemiology at the Bloomberg School of Public Health, oversaw the STD trial from which Brahmabhatt distilled her data. He says the hematoxylin-eosin stain used to test the placentas was chosen to meet the original goal of determining the impact of STDs on HIV transmission, but is not a good stain for malaria because it will pick up only high parasite loads. The investigators are reexamining the placentas using stains that are highly specific for malaria. Interim analyses using these improved stains show that placental malaria is significantly associated with mother-to-child HIV transmission, and that the presence of malaria increases the mother's HIV viral load.

However, a study scheduled to appear in the April 2004 issue of *Emerging Infectious Diseases* by researchers from the U.S. Centers for Disease Control and Prevention and the Kenya Medical Research Institute

found fewer HIV-infected babies born to mothers with placental malaria, although the risk of mother-to-child HIV transmission was increased among mothers with high placental parasitemia. A third study out of Belgium's Ghent University and University of Antwerp and Kenya's Coast Provincial General Hospital, published in the 1 December 2003 *Journal of Infectious Diseases*, found no association between placental malaria and mother-to-child HIV transmission.

Differences among the three studies may reflect a complex balance between the immune response against malaria and the degree of immune suppression by HIV. This balance can tip in the direction of either greater risk of mother-to-child HIV transmission or a protective effect, depending on the degree of immune suppression and the severity of the malarial infection in the placenta, says Robert Newman, a medical officer in the Centers for Disease Control and Prevention Malaria Branch and coauthor of the *Emerging Infectious Diseases* paper.

Of the Brahmabhatt study, Gray says, "Yes, it was a small sample. Yes, it was secondary data analysis, and there are some limits to the methods. Nevertheless, it's potentially an important observation, because if placental malaria really does enhance mother-to-child HIV transmission, that would give us a very strong rationale for much more intense malaria suppression in pregnancy than is now done."

Several hypotheses could explain why having malaria would facilitate mother-to-child transmission of HIV, Brahmabhatt says. Malaria may damage the placenta, increasing the exchange of maternal and fetal blood. Malaria may also increase the expression of a cell surface receptor called CCR5, which HIV uses to gain entry into cells.

Even if malaria does not affect HIV transmission to newborns, says Newman, it's still associated with premature delivery and low birth weight. "In no way do we think that it does not make sense to prevent malaria in pregnancy," he says. "If I were a program manager . . . I would plow ahead with preventing both diseases [among pregnant women]." —David J. Tenenbaum



**Disturbing data.** Placental malaria may foster mother-to-child HIV transmission.

## Making Beds for Oysters

In South Carolina and other states, oyster shells are now almost as popular as their succulent residents. These states collect oyster shells and then replant them in existing reefs to make a suitable habitat where young oysters can settle after floating freely in the water during their larval stage. One state just now catching on to the value of shell recycling is Louisiana, which harvests about 250 million pounds of oysters a year, one-third of the nation's output. The Louisiana Department of Wildlife and Fisheries in Baton Rouge is in the final stage of developing a feasibility plan for recycling oyster shells.



## Renewing the Health of U.S.-Chinese Relations

In 1979, as part of U.S.-Chinese efforts to normalize diplomatic relations, the two countries signed a protocol agreeing to cooperate in the health sciences. In December 2003, they renewed that agreement, the U.S. Department of Health and Human Services has announced. The protocol covers environmental health, as well as disease control and prevention, maternal and child nutrition, infectious diseases, and cataract prevention. It also covers health policy research, administration, and finance. As part of the protocol, Chinese scientists are working at NIH intramural laboratories, and the NIH supports collaborations between U.S. and Chinese scientists. The protocol also supports an initiative in China, announced in October, that urges China to adopt a more open policy concerning the nation's infectious diseases.

## States Fail to Control Smoking

Many states came up short in the American Lung Association's annual review for 2003 of state tobacco control laws, the association announced in January 2004. The review covered four areas: tobacco prevention and control programs, smoke-free air laws, tobacco taxes, and youth access to tobacco. States performed the worst in the first two categories. Six states received high marks for funding tobacco prevention and cessation efforts, but many states are using tobacco settlement dollars to fund programs not related to smoking. During 2003, state cigarette taxes rose to an average of 72¢ per pack. More than 440,000 people die from tobacco-related illnesses each year, according to the American Lung Association.



## SUSTAINABLE DEVELOPMENT

## Going Green Saves Over Time

Making buildings that are easy on the environment doesn't have to be hard on the wallet, according to an October 2003 report commissioned by the Sustainable Building Task Force, which represents more than 40 California government agencies. *The Costs and Financial Benefits of Green Buildings* concludes that a building that incorporates "green" features costs on average 2% more to build than a conventional one, but that over the 20-year life of a building, those features pay back the investment more than 10 times.

According to California's State and Consumer Services Agency, buildings and the water, power, and gas systems that fuel them account for more than 25% of the U.S. greenhouse gases produced each year and consume nearly 39% of the energy consumed in the United States each year. Total cost savings from green buildings come from lower costs for energy, waste disposal, water, operations, and maintenance, as well as savings from increased productivity and health among occupants.

The report authors—including representatives from the consulting firm Capital E, Lawrence Berkeley National Laboratory, and the California Department of General Services—reviewed existing data from more than 300 cost-benefit studies and analyzed the costs of 33 office and school buildings registered for certification under the Leadership in Energy and Environmental Design Green Building Rating System, the largest and most widely recognized

sustainable building design certification program in the United States. These buildings were chosen in part because the builders could provide not only information about the actual building costs but also estimates and models of what the same building would have cost to build conventionally. Because of cost differences introduced by location, "you really need to compare the costs of conventional and green designs for the same building only," says Greg Kats, the report's principal author and a principal at Capital E.

The report authors used a conservative approach in factoring in savings from health benefits, Kats says. Various studies indicate that green features increase occupant health and productivity by 1–7%; this report assumed the bottom of the range, and estimated a 1% increase in productivity to equal \$600–700 per employee per year. "Even a very small change in productivity and health is going to drive a pretty big benefit in terms of cost," Kats says.

The report found that building green is most cost-effective when architects and contractors have experience with green features and integrate them into the design as far in advance as possible. For example, planning for features such as daylighting and task lighting (lighting only specific areas) can reduce the need for overhead lights, which also means the building generates less heat and may require a smaller air-conditioning unit. *Environmental Building News* editor Nadav Malin, who provided research assistance to the report authors, says, "If the team members involved know what they're doing, you can go pretty far down the path of creating a green building without adding extra costs at all."

—Angela Spivey

## REGULATIONS

## The Air Law Payoff

Major federal regulations are giving back more dollars in benefits than they cost, and U.S. Environmental Protection Agency (EPA) air regulations account for the biggest share of those benefits, concludes a 2003 review by the White House Office of Information and Regulatory Affairs (OIRA).

In reviewing EPA cost-benefit figures for 107 federal regulations issued between 1 October 1992 and 30 September 2002, OIRA found that benefits ranged from \$146 billion to \$230 billion, compared to costs of \$36–42 billion. The lion's share of benefits came from four clean air regulations that showed benefits of \$101–119 billion compared to costs of \$8–8.8 billion.

Jonathan Levy, an assistant professor of environmental health and risk assessment at the Harvard School of Public Health, says most of the benefits from these rules—which limit particulates and particulate precursors such as nitrogen oxide and sulfur dioxide—come from decreased deaths, fewer lost workdays, and lower hospitalization costs as a result of cleaner air.

"Reducing public exposure to fine particles promises both public health and economic benefits," says OIRA administrator John Graham. "These rules will be costly to industry and consumers, but science suggests that the benefits, though somewhat uncertain, justify the costs."

But Ben Lieberman, director of air quality policy at the Competitive Enterprise Institute, a public policy think tank, says, "It's pretty clear that EPA is exaggerating." He claims the evidence to support the EPA's calculations is weak, resulting in overblown estimates of the cost of lives saved.



**Just cause?** Four clean air laws may have cost as little as \$8 billion but produced as much as \$119 billion in benefits.

Levy counters that the EPA used reasonable methods to come up with its figures. The methods are based on how much people are willing to pay to reduce their risk of dying in a year and how much workers are paid to take on jobs where there is some risk of death, he says. He acknowledges that coming up with such figures is controversial. "It is difficult to come up with a value, and there is clearly uncertainty surrounding that value," he says. (The EPA did not respond to requests to be interviewed for this article.)

Lieberman also argues that the epidemiologic evidence supporting the benefits of rules regulating particulate matter is weak. Indeed, the OMB report does note that the EPA analysis assumes that all particles are equally damaging, even though there are chemical differences between particle types emitted from power plants and motor vehicles.

While acknowledging that it's plausible that some fine particles may be more damaging than others, James Hammitt, director of the Harvard Center for Risk Analysis, also notes that "very little is known about which [particles] are harmful and which are not," but that as far as scientists can tell, they are all harmful at some level.

—Harvey Black

ehpnet

## MSU-MDCH BLL Test Program

Lead poisoning causes significant public health problems, including learning disabilities, behavioral problems, and even death. According to the Centers for Disease Control and Prevention, blood lead levels (BLLs) above 10 micrograms per deciliter impair learning and behavior in young children. Early detection and treatment can limit and sometimes reverse the health problems associated with elevated BLLs.

In 2002, 92,000 children were tested for elevated BLL in Michigan, yet just 4.4% showed a BLL greater than 10 micrograms per deciliter. To avoid unnecessary testing, the Centers for Disease Control and Prevention funded researchers at Michigan State University (MSU) in East Lansing and the Michigan Department of Community Health (MDCH) in Lansing to create an improved screening tool. The result is the MSU-MDCH BLL Test Program, an online questionnaire, available at <http://midata.msu.edu/bll/>, that effectively predicts which children are likely to be at increased risk for lead poisoning. Only those at risk undergo a blood test, thereby saving laboratory costs.



In Michigan, Medicaid pays \$11 for a blood lead test, and private estimates range up to \$30 per test. Although relatively inexpensive, thousands of children are tested for lead poisoning yearly, and public health agencies often pay the bills. The new website improves cost-effectiveness by identifying those at risk. "It provides the most bang for limited bucks," says Stan Kaplowitz, a professor of sociology at MSU and head of the team.

Previous screening methods to evaluate lead poisoning have traditionally relied on zip code and/or Medicaid information. The Michigan survey is far more comprehensive and asks, for instance, about the child's current and previous addresses, frequency of pacifier use (which slightly reduces risk, Kaplowitz says, perhaps because if a child has a pacifier in his mouth, he's not putting other possibly lead-contaminated objects there), and exposure to peeling paint. The statistical calculations also incorporate detailed information obtained from census block groups, small geographic units that cover 1,000–4,000 people living in a neighborhood. Characteristics of census block groups include the proportion of houses built before 1950, rental properties, percentage of people who did not graduate from high school, and proximity to emissions from industry and roadways. In addition, the evaluation takes into account personal factors, such as family income, whether water is obtained through lead pipes, and whether siblings in the same home have ever been known to have an elevated BBL.

The website "implements fairly complicated mathematical equations to predict lead risk based on where a child lives, characteristics of the neighborhood, and individual information," says Kaplowitz. The researchers used BLL data collected over four years from 90,000 one-year-old Michigan children to map correlations between BLL and census block data, family history, and other factors to predict who is at risk. Answers to the online questionnaire are analyzed statistically and compared to these correlations. The combined information determines the probability, based on responses to the questionnaire, that a child's BLL is sufficiently elevated to warrant testing.

Kaplowitz and his colleagues designed the MSU-MDCH questionnaire to be answered by personnel in medical offices, but anyone can submit answers and receive a recommendation within seconds (although the questionnaire currently can process only Michigan addresses). The online questionnaire, the only one of its type in the nation, provides a model for other states, and the method may be adapted to fit similar data for other locations. —Carol Potera

## Fighting Fishing Pirates

Under the auspices of the Organisation for Economic Co-operation and Development, five maritime countries have established the Ministerial Task Force on Illegal, Unreported, and Unregulated (IUU) Fishing to help stop the growing problem of poaching. British minister of state for the environment Elliot Morley was selected to lead the group, which includes representatives from New Zealand, Australia, Chile, and Namibia. The task force is enlisting the help of scientists, environmental and business groups, and legal experts to develop antipoaching strategies. An April 2004 conference will address IUU fishing activities in a multidisciplinary fashion to generate a more comprehensive range of possible actions.



## From Arsenal to Preserve

The Rocky Mountain Arsenal outside Denver, Colorado, which once produced about 60% of U.S. chemical weapons, is now a Superfund site undergoing decontamination and looking forward to a new role as a wildlife preserve. The arsenal came a step closer to that goal in January 2004, when the Organisation for the Prohibition of Chemical Weapons (OPCW) confirmed that the site no longer has any chemical weapons production facilities or equipment. The OPCW inspects chemical weapon sites to ensure compliance with the 1997 Chemical Weapons Convention.

Of approximately 17,000 acres at the arsenal, 4,927 acres may now be transferred to the Fish and Wildlife Service, the U.S. Environmental Protection Agency announced in January. The site is already home to about 300 species of animals, including deer, coyotes, bald eagles, and white pelicans.

## Breast Cancer in White Women

More than 1 million breast cancer cases and nearly 600,000 deaths occur worldwide annually. U.S. breast cancer death rates have decreased, but since the early 1990s, white women have had a slight increase in the incidence of large tumors (over 5 cm), which are more often fatal than small tumors, reports a team led by epidemiologist Asma Ghafoor in the November/December 2003 issue of *CA: A Cancer Journal for Clinicians*.

The incidence of large tumors increased in white women by 2.1% per year between 1992 and 2000, the team writes. Increased rates of obesity, hormone use, or both may have caused the increase in the frequency of large tumors, the authors suggest. Compared with whites, minority women still have a higher proportion of large tumors, probably because of unequal access to screening and treatment.

